

Astronomy Day from McDonald Observatory
Solar System Scale Activity
Teacher Guide

Materials needed (per student):

- * A 24" sentence strip, or a strip of paper 3" wide by 24" long.
- * Pencil

Directions

- 1) Place the piece of paper on your desk in front of you vertically (so that it is tall instead of fat). In very small letters, write "Sun" on the very top edge of the strip and "Pluto" on the very bottom edge.** *Encourage students to use small print, especially for the Sun. And instruct them to NOT use circles to depict object, just letters.*

- 2) Fold the strip in half (top to bottom) and open it up again, showing the crease.** *Ask the students what object in the Solar System might belong on the crease. Maybe there isn't an object there. Ask what other astronomical objects make up the solar system. Usually, students will respond with the order of the planets – My Very Education Mother Just Served Us Nine Pizzas... or more recently – My Very Educated Mother Just Served Us Nachos. (See note below about Pluto's new "Dwarf Planet" status). You may want to write M,V,E,M,J,S,U,N,P on the board as a reminder.*

- 3) What planet do you think might belong on the crease (halfway from the Sun to Pluto)?** Write your guess on the crease. *If there is time available, you may collect a few strips and tape them to the board and have the class vote on which planet they think is accurate. Next, reveal the answer and hand back the strips.*

- 4) Write in the rest of the planets on the strip of paper, making sure you put them in order and keep their relative locations where you think they should be.**

- 5) When your teacher provides the "answer key", write down the answers on the other side of the paper. Compare the correct answers to your own. How did you do?** *Read the following key to the class, or write down on the board.*

To Make the Answer Key:

- 1) Turn strip over and refold halfway between Sun and Pluto. On the crease, write Uranus.**
- 2) Fold Pluto to Uranus. Write Neptune.**
- 3) Fold Sun to Uranus. Write Saturn.**
- 4) Fold Sun to Saturn. Write Jupiter.**
- 5) Fold Sun to Jupiter. Write No Planet or Asteroid Belt.**
- 6) Fold Sun to Asteroid Belt. Write Mars.**
- 7) Fold Sun to Mars. Write Venus.**
- 8) Write Mercury in between Sun and Venus.**
- 9) Ask students which planet is missing. Write in Earth in between Venus and Mars.**

Distance from the Sun *

<u>Planet</u>	<u>(AU)**</u>	<u>(10⁶ Kilometers)</u>
Mercury	0.3871	57.9
Venus	0.7233	108.2
Earth	1	149.6
Mars	1.5237	227.9
Jupiter	5.2028	778.3
Saturn	9.5388	1427.0
Uranus	19.18	2869.0
Neptune	30.0611	4497.1
Pluto	39.44	5900

* Although the orbits of all planets are almost circular, their actual shapes are ellipses. The numbers given are the average distance from the sun to the planet, called the semi-major axis of their ellipse.

** AU stands for Astronomical Unit. It represents the average distance from the Sun to the Earth.

Texas Essential Knowledge and Skills (TEKS) covered:

112.5-3.3(C); 112.6-4.3(C); 112.7-5.3(C); 112.22-6.3(C); 112.23-7.3(C); 112.24-8.3(C): Students represent the natural world using models and identify their limitations.

112.5-3.11(C): Students identify planets in our solar system and their position in relation to the Sun.

A couple of notes on Pluto's uniqueness:

“Dwarf Planet”:

In August of 2006, the International Astronomical Union voted to redefine Pluto as a “dwarf planet”. The reason this was done is because around the year 2000 astronomers were beginning to find other objects in our solar system that were very much like Pluto, one of which (Eris) is even bigger than Pluto. If Pluto was to still be called a “planet”, then all of these new objects were going to need to be called “planets” as well, and our list of planets would begin to grow indefinitely. A line had to be drawn somewhere. Astronomers decided that the best definition for a planet would have to exclude Pluto. The new definition of a “planet” in the solar system is a celestial body that: 1) is in orbit around the Sun, 2) has enough mass to obtain a nearly round shape, and 3) has ‘cleared the neighborhood’ around its orbit. The newly created term “dwarf planet” was defined similarly, except for the 3rd part, meaning that it hasn’t been able to clear out other bodies of comparable size from its orbital zone. Pluto hasn’t cleared out other ‘large’ objects from its orbital zone, hence it is now called a “dwarf planet”.

Pluto's unique orbit:

Pluto's orbital path around the Sun is very far from being circular, its elliptical orbit is much more eccentric than the eight planets. At times, Pluto is 49 AU from the Sun and at other times it is only 29 AU from the Sun, bringing it slightly closer to the Sun than Neptune (though they will never collide). In addition, Pluto's orbit is highly inclined (tilted about 17°) relative to the orbital plane of the planets (the ecliptic).

This activity was adapted from an activity created by Pam Whiffen of The Solar System Ambassadors Program - sponsored by the Jet Propulsion Laboratory, Caltech, and NASA